

A QUICK INTRODUCTION TO MAPLE

Version 2.20.04

STARTING MAPLE

The program is on most of the computers in on the fourth floor of Clapp. To start the program, find the Maple icon (a maple leaf) and double click on it. (If you can't find this, go to the "start" menu at the bottom left of the screen and choose "programs".) Be sure to choose the most recent version of the program. To quit, choose "exit" from the "file" menu.

MAPLE AS A CALCULATOR

To add the numbers 2 and 3, for example, enter:

$$2 + 3;$$

and hit the return key. Maple will respond with

$$5$$

Note that every command entered into Maple must end with a semicolon. (It's a common error to forget this.) Multiplication is indicated by *. For example, to multiply 2 by 3, enter

$$2*3;$$

You have to use the * symbol whenever two things are multiplied. For example, to find $8(7 + 3)$ you have to enter

$$8*(7+3);$$

Since Maple is a computer algebra program (rather than a calculator) expressions often come back in symbolic form. For example, the command

$$1/7;$$

returns

$$1/7$$

ie one divided by seven. To find a numerical value of this expression enter

$$\text{evalf}(1/7);$$

("evaluate as a floating point number") and you will get

$$.1428571429$$

This is to ten digits. If you want more digits, say 50, enter the command

Digits := 50;

(note the capital “D”) and from then on Maple will do numerical computations to 50 places.

FUNCTIONS and CONSTANTS

- The constant π is represented by Pi. (Note the capital P.)
- The constant e is E.
- Infinity (∞) is infinity.
- The square root of -1 is I.
- $\sin x$ is `sin(x)`, $\cos x$ is `cos(x)`, etc.
- e^x is `exp(x)` or `E^x`.
- $\ln x$ is `ln(x)`
- $\arcsin x$ is `arcsin(x)`, etc.
- \sqrt{x} is `sqrt(x)` (or you can do it as $x^{1/2}$, ie as `x^(1/2)`).

MISCELLANEOUS

- The simplest way of changing the previous expression is just to click on it with the mouse and edit it. You can also use “copy” and “paste” from the “edit” menu just as in a word processor.
- For help on a particular topic go to the “help” menu. If you highlight a term before calling up the help menu, that term will appear as one of the options in the help menu.
- Note that capital letters are treated differently from lower case ones.
- For more information on the program, look in the red book “First leaves: A tutorial introduction to Maple V” which usually is lying around somewhere.

- To abort a calculation which is taking too long, push the red “stop” button.

SOLVING EQUATIONS

To solve the equation

$$2x + 4 = 5x$$

for x , enter

```
solve(2*x + 4 = 5*x, x);
```

Note the extra x at the end of this command to indicate the variable that one wants to solve for. To solve this equation numerically, enter

```
fsolve(2*x + 4 = 5*x, x);
```

You have to put the multiplication sign between constants and variables, and between variables. For example, the expression $2xy$, where x and y are variables, is entered as $2*x*y$. To solve two equations for two unknowns, for example

$$y = 2x$$

$$x + y = 6$$

enter

```
solve({y=2*x,x+y=6},{x,y});
```

If Maple replies to a solve command with “RootOf”, you should use “fsolve” to get a numerical answer.

Other useful commands are `expand` and `simplify`.

GRAPHS

To plot the graph of $\sin x$ for $x = 0$ to $x = 6$, enter

```
plot(sin(x), x=0..6);
```

Note that the horizontal domain of the graph is given by the two values with dots in between. You can also specify the vertical range:

```
plot(sin(x), x=0..6, y=-1..1);
```

If you wish to plot the functions $\sin x$ and $\cos x$ on the same graph, enter

```
plot({sin(x), cos(x)}, x=0..6);
```

CALCULUS

Derivatives: To calculate

$$\frac{d}{dx}(4x + \sin x)$$

enter

```
diff(4*x + sin(x),x);
```

Note the x at the end to indicate the variable of differentiation.

Indefinite integrals: To find the indefinite integral

$$\int e^x dx$$

enter

```
int(exp(x),x);
```

If Maple can't find an antiderivative in terms of elementary functions, it just prints the integral again.

Definite integrals: To find the definite integral

$$\int_1^2 e^x dx$$

enter

```
int(exp(x),x=1..2);
```

If Maple just prints the integral again, alter the command by putting `evalf` about it:

```
evalf(int(exp(x),x=1..2));
```

This asks for a numerical evaluation of the previous expression, which in this case is a numerical approximation of the definite integral. Note that improper integrals can be evaluated too. For example, the integral

$$\int_1^{\infty} e^{-x} dx$$

can be computed by entering

```
int(exp(-x),x=1..infinity);
```

Limits: To find

$$\lim_{x \rightarrow 0} \frac{\sin x}{x}$$

enter

```
limit( (sin(x))/x, x = 0);
```

Series: To find $1 + 1/2 + 1/3 + 1/4 + \dots 1/100$, enter

```
sum(1/i, i=1..100);
```

Taylor series: To compute the Taylor series of the function $\ln x$ about the point $x = 1$ through the term of order 10, enter

```
series(ln(x), x=1, 10);
```

A.D.